DIRECTION OF MOVEMENTS OF CHILDREN IN EMOTIONAL RESPONSES

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HISTORICAL INTRODUCTION

THIS experiment was devised to investigate to what extent, if any, the reactions classified as positive and negative reactions in studies of lower organisms may be important in the study of the emotional behavior of children; and to find what relation, if any, exists between spatial factors in the environment and the general reaction pattern of children under conditions that are generally considered emotion provoking. The problem may be briefly enunciated as follows: What is the direction of gross body movement of children to spatially controlled stimuli? Does this direction of movement indicate emotion?

The idea of spatial reaction as an index of emotional behavior has been slowly developed in child psychology. Watson (9) introduced the positive and negative terminology into experimental child studies. He has a paragraph caption "(9) Positive Reaction Tendencies." He writes, "infants respond positively to nearly all small objects which are given a high stimulation value by moving them. No definite avoiding tendencies have been noted at this age, except those mentioned under blinking and defense reactions. . . . . Although we are not prepared to insist upon it we are inclined to believe that man is originally endowed with various kinds of positive reaction tendencies, but with few negative reaction tendencies."

Watson's eighth trial of "Albert" is described as follows: "The instant the rat was shown the baby began to cry. Almost instantly he turned sharply to the left, fell over, raised himself on all fours and began to crawl away so rapidly that he was caught with difficulty before he reached the edge of the table." Of this reaction Watson claims "This was as convincing a case of a completely conditioned fear response as could have been theoretically pictured." Generalizing on Watson's three emotions Tolman (8) states, "It must be observed that all response tendencies would apparently fall into one or the other, of the two classes of 'tending to remove' or of 'tending to continue and get more of' the stimulus. Anger and fear go into the first group and love in the second." But these classes translated into environmental terms are equivalent to reactions which decrease distance and make contact or increase distance.

Sherman (7) also detected this bipartile behavior reaction in infants and reduces all behavior of the newborn to the categories of the positive or negative reactions. He writes thus:

"The genesis of the specific emotional reactions of children and adults lies in the responses available to the newborn infant. The reactions are first generalized, but even in the earliest responses two types of reactions are noted: (1) that of rejecting the stimulus, and (2) that of accepting the stimulating condition."

Leslie Marston (6) makes positive and negative spatial movements of children a significant basis for measuring social resistance and compliance. Making a summary of results, he writes "In this experiment the children differed in degree of social resistance from the most extroverted, who showed no resistance but unhesitatingly approached the stranger and uninvited played with the toy (score 5) to the most introverted whose social resistance withstood the stranger's advances and rejected his inducements (score 0)."

Spatial specifications and relations have been used by Levy and Tulchin (5) in the description of resistance behavior of 983 children tested at a county fair and of 110 others tested under controlled conditions in the laboratory. In the first study they conclude: "The manifestation of resistance by infants and children during mental testing is evidence of some innate behavior pattern." In the second study the authors analyzed the resistance behavior into 8 pattern groups, the sixth of which contains the following: "Several withdrawal movements with or without taking the object; walking back to mother; turning head and burrowing in mother's clothes; turning head away toward mother, holding head downward, covering face with hands, looking away."

The presence or absence of a positive spatial reaction is the criterion of scoring most items of Gesell's (1) maturity chart for one-year-olds. These items which he considers symptoms of developmental levels, are all, except one concerning speech, reducible to spatial movements of the infant in response to a stimulus object. The same criterion of scoring maturity is found in his scale for pre-school children (2).

M. C. Jones (4) while eliminating fears from children found that the "direct conditioning" was the best method of elimination. It should be noted that in this process the spatial relation of the animal was at every stage of the process the measure of the emotional equilibrium of the children being unconditioned.

According to a study of H. E. and M. C. Jones (3) jumping frogs, jack-in-the-box, and upsnapping beetles most frequently elicit fear reactions in children, while worms and catepillars produce no more than mild curiosity. The difference in these groups of stimuli lies in the sudden and extended locomotion or spatial changes of the former compared to the latter.

In an experiment with six young children, thirty-six older children ranging from six to 10 years and 90 collegiate adults in the presence of a harmless snake 6 feet long and 4 inches in girth, these authors describe the reactions largely in spatial terms. Some of the terms are the following: "reached and grasped," "held his ground," "started to leave," "took up a post of observation outside of pen,"

"drew away," "moved forward," "crowding close," "climbed on table," "refused to come near," "ran around behind the circle," "nearly one third refused to have the snake brought near," "the remainder reached forward." Broadly the whole array of subjects in an emotional situation are divided into those who permitted the object to be near or reacted positively and those who acted in a contrary manner.

Apparently positive and negative reactions are characteristic of the behavior of children in responding to stimuli that provoke emotion. The aim of this study is the experimental determination of the positive and negative reactions of children under conditions that vary the spatial factors in the relation of the child to the stimulus.

PROCEDURE

It was desired to present two situations, one in which the subject was placed free in a spatial relation to a stationary stimulus object and the other where the child was relatively stationary while the stimulus was moved toward or away from him.

For this reason two tests were devised. The one called the Sitting test, in which the child was fixed in a chair and animals as stimuli-objects, were moved toward and away from the child. The second test was the Standing test, in which the controlled conditions permitted the child to stand freely in space in the presence of animal-stimuli which were relatively fixed, on a table.

Thus both tests reveal body movement of the child in space. The sitting test provides observation of small spatial trunk swaying of the child in the chair, under controlled conditions. The standing test gives a record of the gross spatial movements of the walking child with the stimulus object restricted.

The reactors were children from the Child Institute of the Johns Hopkins University. There were 22 reactors, 15 were boys and 7 were girls. Their ages ranged from thirty-six to sixty-four months. Twenty of these participated in the standing test. The Intelligence Quotient of each was above 1.00. A few refused to submit to the chair situation; a few entered after the completion of the standing test. As a rule the child freely said "Take me" and tended to run ahead of Experimenter into the experiment room but in the cases of A and R it was necessary to coax. N could not be induced to walk through the corridor to the observation room unless accompanied by an institute assistant.

Apparatus for sitting test

The sitting test involved a relatively fixed subject and a moving, *i.e.*, approaching or receding stimulus animal. Actually the child could move several inches each way in the chair. The stimuli were moved through a distance of 24 inches, in three or six inch intervals, toward or away from the child. The movements of child and of stimulus were mechanically recorded.

The apparatus for the sitting test is illustrated in figure 1. It consisted of a chair with a back, two arm rests and a front tray, something like a baby high chair. The rigid parts of the chair in contact with the body, that is, the back, the sides and the

front were equipped with an air cushion for each. These 4 air cushions made of inner tube sections were connected by separate tubings with 4 individual pressure bulbs and recording tambours; thus forming 4 closed pneumatic systems. Any body movement of the sitting child in a ventral, dorsal or lateral direction was transmitted to the respective tambour and there recorded on a kymogram.

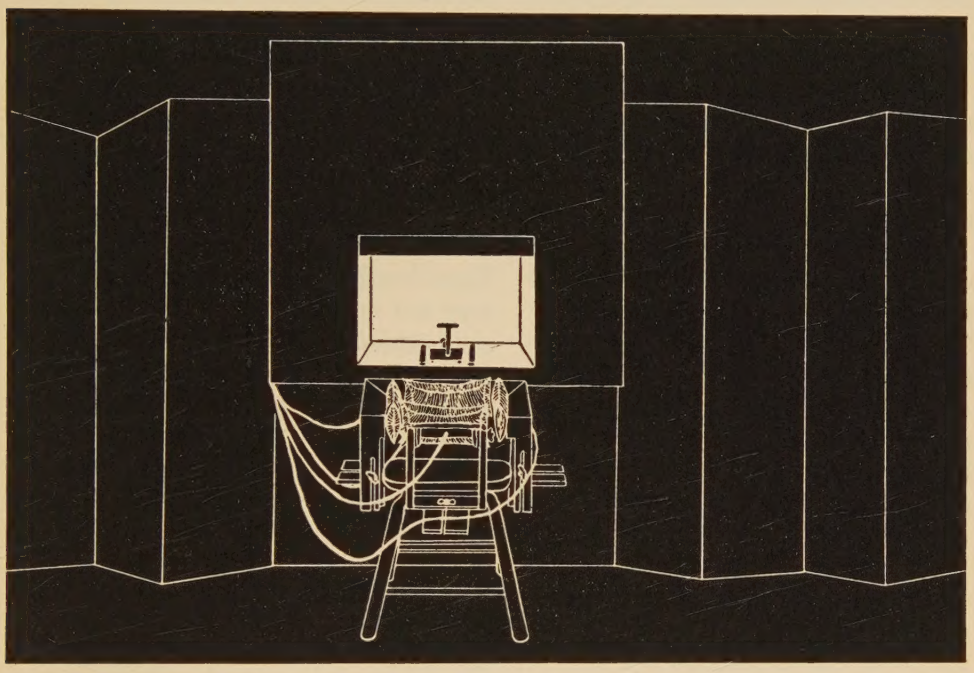

FIG. 1. APPARATUS FOR SITTING TEST

The exposure apparatus or stimulus-stage consisted of a small stage having a cubic extension of 2 feet, built upon a table. The front of the stage was equipped with a screen which could be raised or lowered at will by the Experimenter to expose the stimulus object. A metallic point on this screen automatically recorded on the kymogram the opening and closing of the drop-curtain and the exposure of the stimulus at the initial position.

In the back of the stage an opening equipped with 2 points of an electric circuit was made at the center at the floor level. Fitting into this opening and moving through it was a one inch wooden rod equipped with circling bands of zinc, at every three inches to record the movement of the rod. When the tray bearing the animal stimulus was moved forward or backward by means of the rod projecting through the rear stage wall, the metallic rings closed the electric circuit and the position of the stimulus tray was kymographically recorded. A scale in inches was marked on the rod carrying the stimulus which was moved

forward or backward on the stage by the Experimenter standing behind the screen. A stop watch was used to make the intervals between stimulation at given distances uniformly 30 seconds. The exact time interval was mechanically recorded on the kymogram. The illustration shows the animal tray equipped with a small perch for the paroquet experiment. The other animals were bound to the tray.

In the ceiling of this small stage a mild electric bulb was placed which shone down upon the stimulus object and afforded uniform illumination at all times.

The recording apparatus consisted of a kymograph and 6 markers, 4 of which were pneumatic and 2 magnetic. The 4 pneumatic markers were tambours, one each for the 4 air-pressure cushions acted upon by the movements of the child in the chair. On the kymogram the top or L line shows the record of the left side movements or compression by the moving child, the R line represents the right lateral movements, the V line the ventral pressures, and the D or fourth line the dorsal compressions.

The 2 magnetic markers were activated as follows: The fifth marker or time line was operated from a continuously running electric clock in an adjoining room; the bottom marker recorded the raising and lowering of the exposure screen and the positions of the stimulus rod and animal.

Stimuli objects. The stimuli objects were animals. The introductory stimulus was a ten inch glass bowl containing 2 gold-fish, each 2 inches in length. This was used on the regular exposure stage with the air-cushions under compression.

The other stimuli were, a small green frog, 2 ounces in weight; a large market frog, 11 ounces in weight; a white rat, body 6 inches long; a gray rabbit, 4 pounds in weight; and a green paroquet 6 inches long.

These animals were attached to the stimulus-rod and moved toward or away from the child sitting in the chair. The frogs were fastened to the tray by means of strings tied to their legs and hands, which made hopping impossible. The rat and rabbit were held in place by a wire passed around their neck and fastened to a ring between their fore legs. These bands were quite invisible, and were not once remarked upon by the child-subjects. The paroquet was trained to sit on a perch while being exposed. However it was prevented from flying away by a fine eye-glass chain which was passed around its leg and attached to the perch. The chain was quite visible. Except for the frogs which slowly writhed on their tray the stimuli animals were quiet, and never moved off their tray during exposure.

Procedure of the sitting test. In the beginning the Experimenter addressed a group of children as follows: "I want to show you something next door. I will be able to take only one at a time. It is now ——'s turn." Later the appointments were made through the Institute assistants in order to avoid disturbance of group activities. The same arrangement applied when the subjects were taken from the playground.

On arrival at the test room, the

subject was asked to take off outdoor top-clothes if he had them on, was engaged in a casual conversation about the room and permitted to play for a minute with a new toy; then asked to sit in the chair. He was told "In a few minutes I will show you something in that window."

The child was permitted, even encouraged to get in the chair by himself. In case of climbing inability the Experimenter assisted him into chair, then said: "Won't you let me move the arms of the chair closer to you so they fit snugly?" and thereupon adjusted cushions. Next, "Let me put this arm-rest (tray) under your arms to make you comfortable. This fits like a baby chair, doesn't it? Do you have one, at home? etc." Experimenter left subject a minute and adjusted the pressure of the 4 air systems each of which had an individual bulb. Coming back to the child, he said: "Let me move you nearer the window, so you can see the things I want to show you. Lay your hands on the tray like this." The chair was shifted in a position directly in front of the screen, as shown in the diagram of apparatus. Experimenter placed the hands palms down on the tray in a relaxed position, then said, "Now I'll go and open the window for you to see what is there."

When tambours were balanced, the child was asked, "Are you ready?" and the kymograph was started. After counting five, the curtain was raised exposing the animal at the initial 24 inch distance, stop watch was started, and the behavior of subject was recorded in writing.

The stimulus object was permitted to rest in a given position approximately 30 seconds and then pushed forward, not jerked, 3 inches during the space of 1 second to the next position. Such forward movements were made until the stimulus object reached the edge of the stage, or as far as the child would tolerate it. Then the stimulus object was drawn back 3 inches as every 30 seconds elapsed until the initial position was regained which was also maintained for 30 seconds, following which the curtain was dropped. At the end of the series when the drop curtain was lowered the child was immediately released by unlatching the tray of the chair. The child was then engaged in some irrelevant conversation, permitted to play with a toy for a few minutes, helped to put on his top clothes and escorted back to the playground or work-room.

The following modifications of procedure were introduced. The experimenter spoke to the child when crying seemed imminent and asked "What is it?" Usually no answer was given to direct questions as "Will he bite, jump, or fly?" In case of the child protesting and wanting "to go and get out," he was put off repeatedly by saying, "Just a minute longer." In a few cases of continuous protest, extreme agitation and loud crying the series of approaching positions was shortened and even the curtain dropped. However, the necessity of rapport, future coöperation and the welfare of the children required such individual variations of the procedure. It is our opinion that the active factors in the situation operated in spite of the shortening of exposure and approach series, by reason of a lowered reaction

threshold, in the very few cases where this occurred.

Results of sitting test. The data of this sitting test were treated by application of the fifth experimental method of John Stuart Mills. Mills' formulation of the law of the "Method of concomitant variations" is as follows: "Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon or is connected with it by some fact of causation." Simultaneous variation of position of the subjects as recorded by the tambours with that of the animal stimuli as recorded by the electro-magnets are assumed to show a causal dependence of the behavior of the children upon the spatial movement of the stimuli.

After a shellac bath, the kymographic records were read by means of a transparent triangle engraved in centimeter units. In this reading the time line or stimulus line was used as the base line. Readings of the height of the pressure line were taken for each second or each two second periods. The readings for the interval from one distance of stimulus to the next were averaged for that period. These averages were considered an expression of the directional activity for the given distance. Thus in the case of Q reacting to the rabbit as shown in figure 2, III we have

Stage. in...	24	21	18	15	12	15	18	21	24
Left, cm...	13.5	13.3	12.8	13.3	13.0	12.6	12.9	12.5	13.0
Right, cm..	11.1	11.5	11.3	11.7	11.8	11.8	10.8	10.0	99.9
Ventral,cm.	8.1	8.3	8.1	8.7	8.5	7.8	7.2	6.8	6.5
Dorsal, cm.	2.5	2.3	2.5	2.1	2.2	2.5	2.7	3.2	4.2

Ventral and dorsal concomitance. By concomitance is meant that as the stimulus moves successively in a forward or backward direction the subject reacts in a consistent direction that is somewhat proportionate to the movement of the stimulus by moving forward or backward or vice versa. This does not mean that such consistency existed throughout the exposure series in every case but it does mean that there was a proportionate variation in the subject's behavior in four or five successive stages. Nor does this mean that dorsal variation must always compensate or balance ventral variation and vice versa. This is due to the fact that the dorsal and the ventral contours of the body are not symmetrical, like the lateral contours. Hence concomitance is read from either dorsal or ventral data, not necessarily from both. In case of a longer series of concomitant variations one stage or measure out of proportion was not considered to destroy the concomitance.

The inches refer to the position or distance of stimulus from the child. The centimeters refer to the height of the tambour record above the base line of the kymogram. The letters L., R., V., D., mean left, right, ventral and dorsal compressions, respectively.

In the record of Q and rabbit shown in figure 2, III we note concomitant increase in the ventral pressure and a concomitant decrease in dorsal pressure as the stimulus object approaches the subject. This is a case of positive concomitant variation.

Positive variation, *i.e.*, increased ventral pressure with the approach of the stimulus can also be noted in figure 2, IV of H's reaction to the rabbit. Increased dorsal pressure is

apparent in figure 3, representing reactions of C to large frog and of D to the rabbit.

The scoring of a concomitant variation does not signify there may not have been more than one series of successive variations in a given test for a give individual. In case there were more than one, only one was recorded and scored. Thus a child may have been concomitantly positive up to the mid point of the series and then suddenly become negative and relaxed as the stimulus receded or may have maintained a negative summation attitude The scoring for "none," for the absence of concomitant variation does not signify anything as to the positive or negative orientation of the reaction. It only signifies that there was no proportionate dorsal or ventral movements although there may have been such an abundance of movement as to make subsequent analysis impossible.

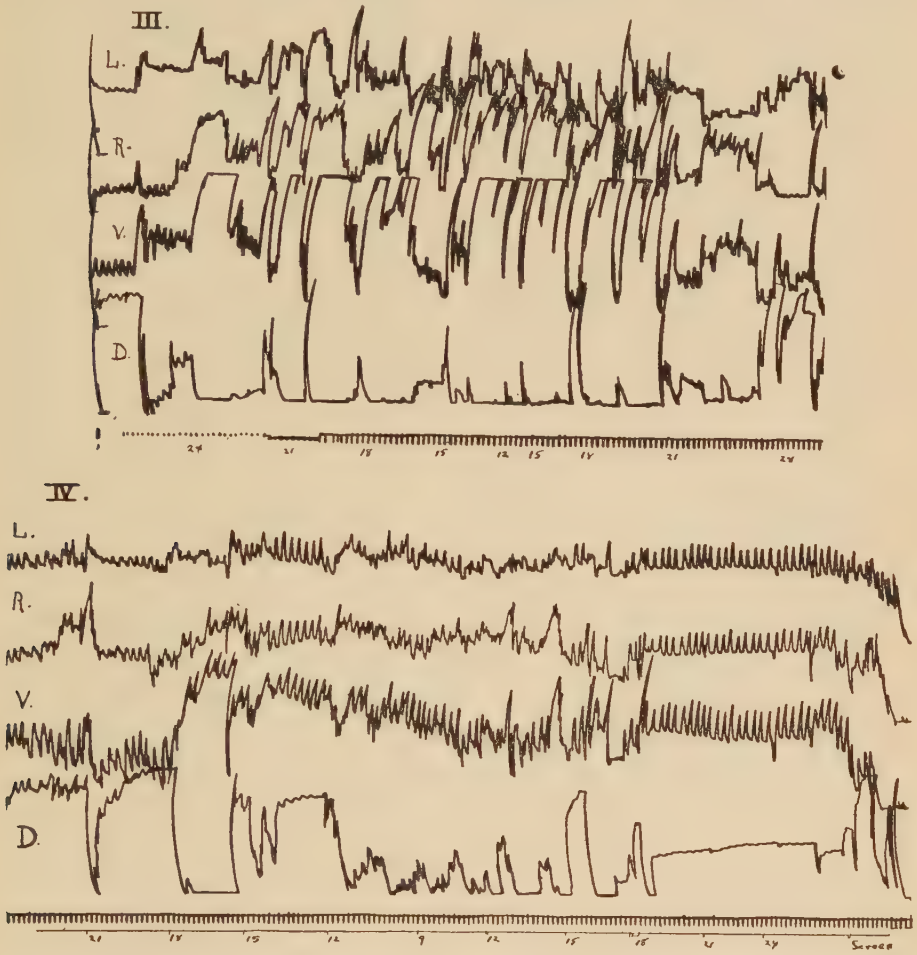

FIG. 2. POSITIVE CONCOMITANT VARIATION IN REACTIONS TO RABBIT. III, *Q*. IV, *H*

In obtaining these measures it has

at times been necessary to discount the first reading which occurred with the raising of the drop-curtain. The upward movement of this curtain usually causes a dorsal compression due to the eye and head raising to fixate the moving curtain, this in turn adds weight to the backward balance of the body. Furthermore some children are inclined to try to peep as the

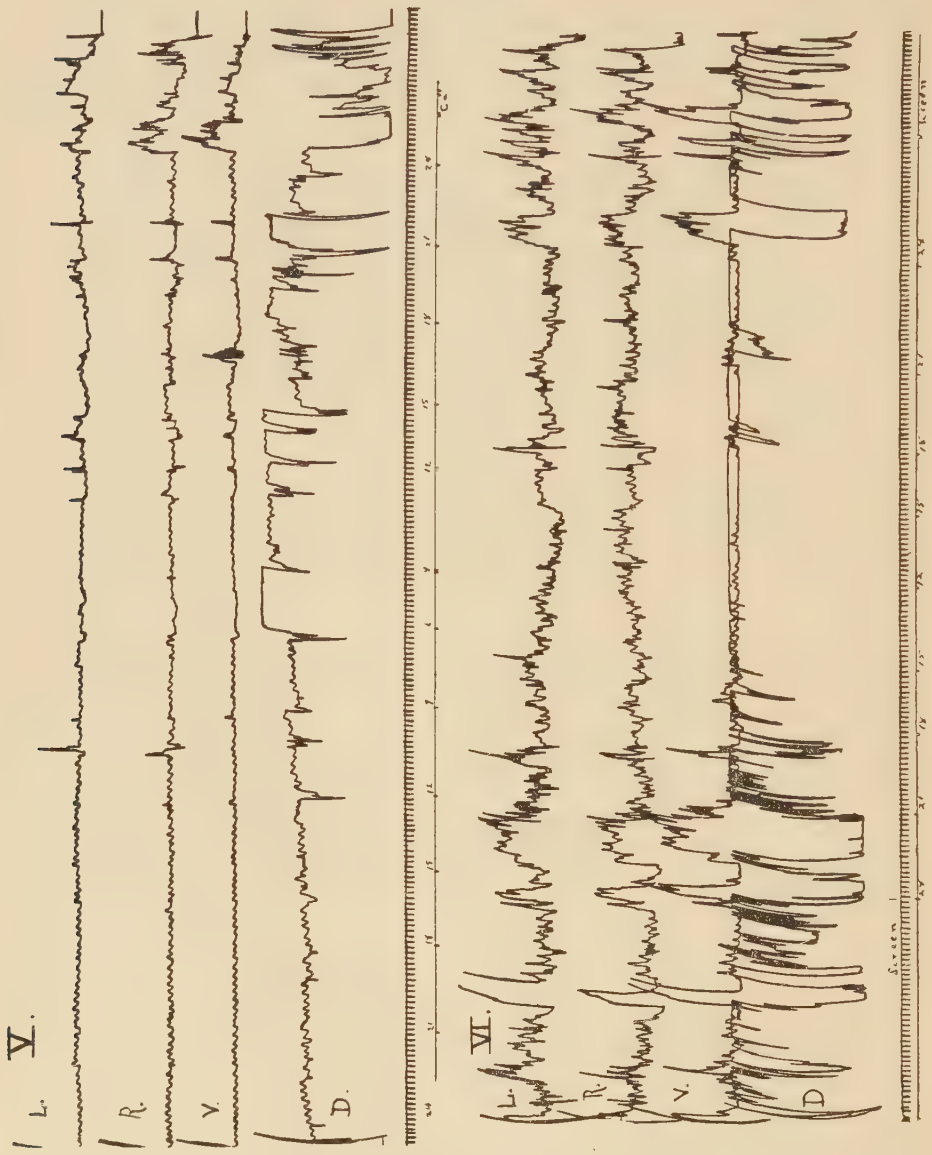

FIG. 3. NEGATIVE CONCOMITANT VARIATION. V. *C* TO LARGE FROG. VI. *D* TO RABBIT

curtain starts to move. This would occasion a dorsal pressure due to lowering the head.

Later concomitant variation. Lateral concomitant variation of reaction is taken to be successively increasing or decreasing pressure on the left side with a decreasing or increasing pressure on the right side in proportion to the movements of the stimulus object or vice versa. Since the lateral sides of the body are symmetrical negative movements on one side ought to be accompanied by positive movements on the other side. Simultaneous positive or negative variation on both sides is an artifact due to friction of the body moving in a ventral or dorsal direction and hence can not be scored as lateral movements. Such recorded bilateral scores neutralize themselves in so far as they destroy concomitance.

A trifling source of error more frequent on the ventral side than on the lateral sides was the manipulation or finger pinching of the edges of the air cushions. Finger manipulation did not occur frequently and unless all the fingers were simultaneously involved did not introduce a notable compression variation.

Much of the lateral compression was caused by arm movements of the children while reaching for the stimuli. The arm extension and its projection tended to draw the shoulder in the same direction and similarly to move the given side of the body forward. This likewise caused a frictional pressure on the lateral cushions although the body did not move to the right or left. Obviously most of the lateral movement as recorded was of a non-concomitant frequency.

Positive and negative reactions. Table 1 gives the reaction of children to approaching or receding stimuli. Obviously the fact of the presence of concomitant variation does not tell us whether it occurred in relation to the coming or the going stimulus and whether it was positive or negative. For this reason the reactions of the children were analyzed and divided on the basis of the coming and going movements of the stimuli. Movements as noted on this table do not imply that they were all concomitant but that the general trend was of an approaching, pursuing, retreating, or withdrawing pattern on the part of the subject for a certain part of the series. Many of them were of the concomitant variation type. In this table concomitant variations which reached across the central point of the series are split as is demanded by the double basis of analysis reading from 24 inches to 0 inches and on the other hand from 0 inches to 24 inches. Thus in the case of Q with the rabbit, his behavior is analyzed as approaching the coming stimulus and pursuing it when receded, hence the reaction is concomitant and positive to the movement of the stimulus throughout. This is illustrated in figure 2 and records a case of retreat to the approaching object and withdrawals from the retreating object. Figure 4,I records a negative reaction to a stationary stimulus. Figure 4,II records a highly negative reaction which lasted as long as the stimulus was exposed. One may note sharp rise of dorsal pointer after exposure and sharp drop after screen closure.

The high percentage of concomitant variation in the total of the tests shows

that there is a definite causality between the successive spatial positions of the stimuli and the reaction behavior. Not only does the stimulus cause a reaction but proportionate proximity and proportionate distance of the same stimulus causes a proportionate or concomitantly varying behavior. Factors of space are active principles in the behavior of children in their emotional behavior. A case of the absence of any concomitant variation of the dorsal and ventral aspects may be seen in figure 5, VII recording reactions of M to the white rat.

The small proportion of the concomitant lateral movements as shown in table 2 in relation to the moving stimulus shows that the stimulus did not cause lateral movements, that is, lateral movements are not an important factor in reacting to approaching stimuli.

In table 3 the ventral and dorsal pressure variations are shown for the individuals in the group when the large frog was the animal that was approach-

TABLE 1

Cases of forward and backward movement
or
Ventral or dorsal concomitant variation of children with successively varying stimulus
c.v., concomitant variation; *none*, absence of concomitant variation

CHILD	SMALL FROG	WHITE RAT	LARGE FROG	RABBIT	PAROQUET	C.V.	NONE
A	−c.v.	−c.v.		−c.v.	−c.v.	4	
B	−c.v.	c.v.	none	c.v.	−c.v.s.	4	1
C	none	none	−c.v.	−c.v.	−c.v.	3	2
D	none	−c.v.	−c.v.	−c.v.	none	3	2
G		−c.v.	−c.v.	−c.v.	−c.v.	4	
H	−c.v.	none	none	c.v.	c.v.	3	2
J		none	−c.v.	−c.v.s.	−c.v.s.	3	1
K	−c.v.	c.v.	−c.v.	−c.v.s.	none	4	1
L	−c.v.			none	c.v.	1	2
M	−c.v.	none	c.v.	c.v.	c.v.	4	1
N	none	−c.v.	none	−c.v.s.	none	3	2
O	c.v.	c.v.	c.v.	−c.v.	−c.v.	5	
P	c.v.	c.v.	c.v.	−c.v.	−c.v.s.	5	
Q	−c.v.	−c.v.	−c.v.	c.v.	−c.v.	5	
R	none	−c.v.	−c.v.	−c.v.s.	none	3	2
S	−c.v.	−c.v.s.	−c.v.s.	−c.v.	−c.v.	5	
T	none	−c.v.	−c.v.	−c.v.	−c.v.	4	1
U	none	c.v.	none	−c.v.	c.v.	3	2
V	−c.v.	−c.v.	−c.v.	−c.v.	c.v.	5	
Total:							
c.v.....	11	14	13	18	15	71	
none....	6	4	4	1	4		19

c.v., 79 per cent; none, 21 per cent.

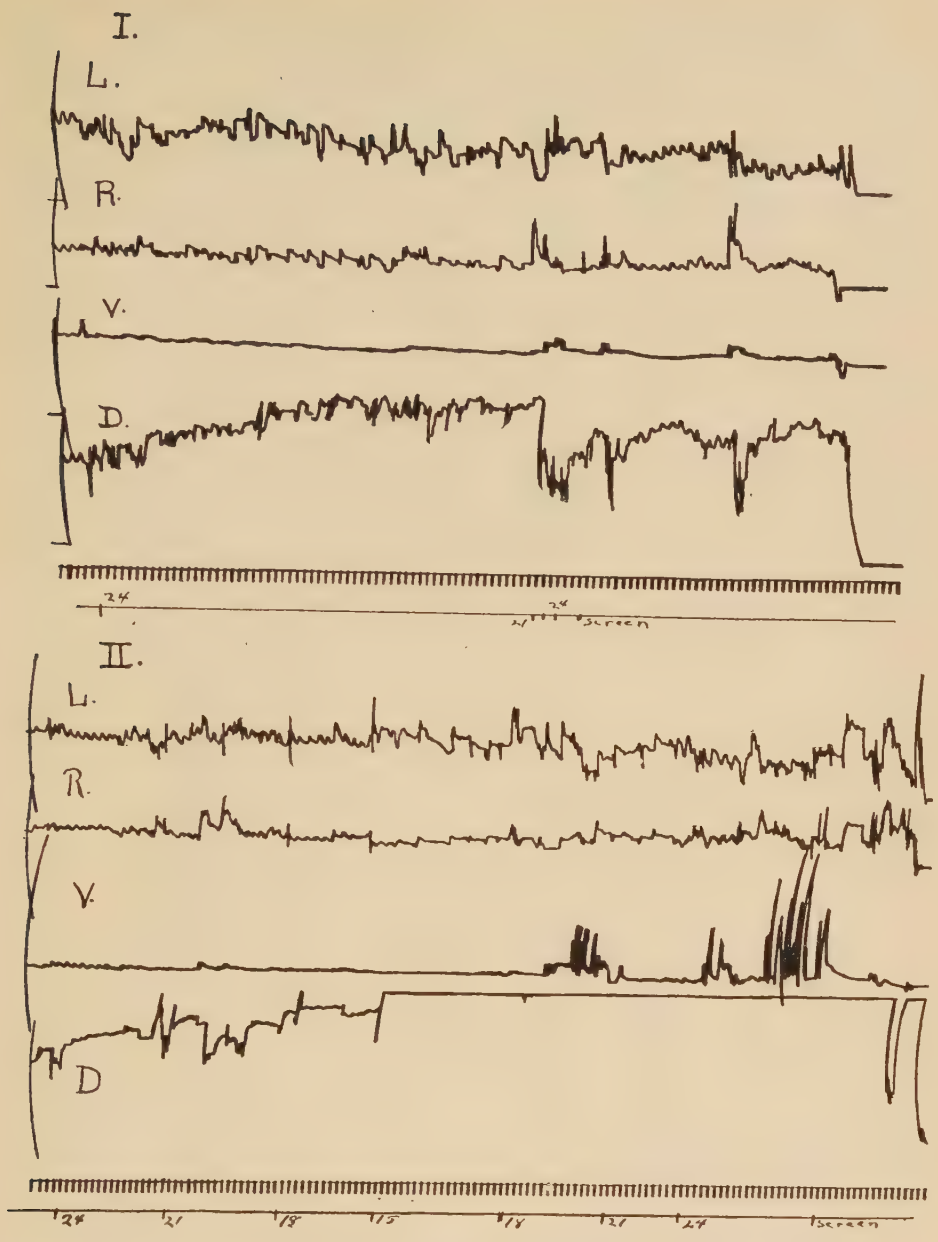

FIG. 4. NEGATIVE VARIATION AND SUMMATION. I. *R* TO STATIONARY RABBIT. II. *A* TO MOVING PAROQUET

ing or receding from the child in the chair. The highest point of the pressure line within a two second interval as recorded on the drum was read and

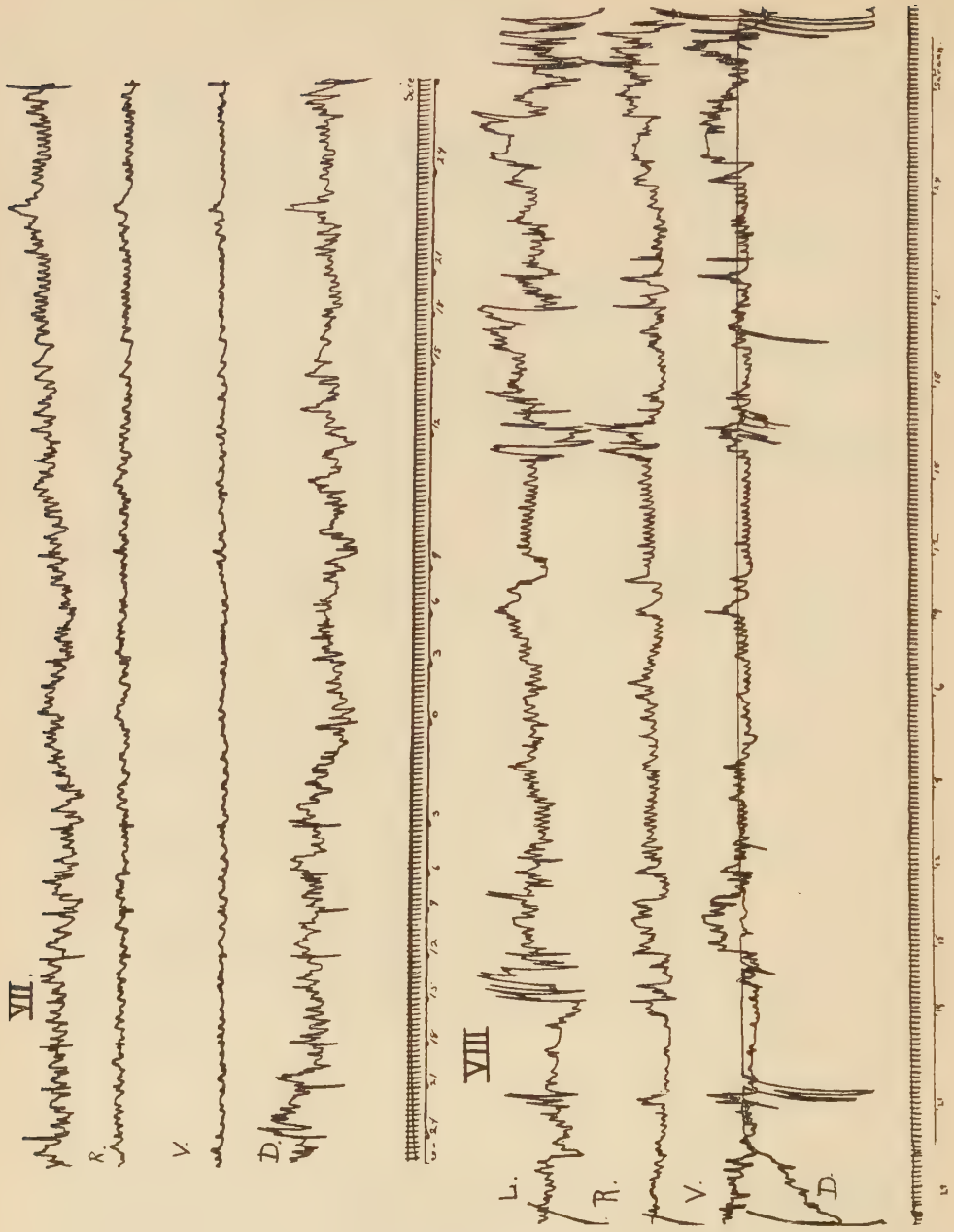

FIG. 5. NO CONCOMITANT VARIATION AND CONTINUOUS NEGATIVE REACTIONS. VII. *M* TO WHITE RAT. VIII. *H* TO LARGE FROG

listed. The average of these readings for the period from the presentation of the animal at a given distance from the child to the next presentation

at another distance was calculated. These mean scores are shown for varying distances. In figure 6 the group curves and those for individual C illustrate the variations in pressure to the approaching and receding frog.

Reactions to different animals. In table 4, the data show that the small frog elicited the least number of positive reactions, the second largest number of negative reactions and by far the largest number of doubtful reactions. This was the first item in the series and strangeness or novelty of the apparatus may have been operative. Comparing the reactions to the small frog with those to the large frog one notes the increasing number of positive reactions to the larger frog. The larger frog also happened to be later in the series. During the interval between the testing with the small and the large frog a month had elapsed during which all but G and J had had opportunity to react to two small frogs in the play room for a few days. In the case of the large frog, doubtful reactions are greatly reduced to one third of the number to little frog.

The white rat is the only animal which elicited more positive reactions than negative ones. This is probably

TABLE 2

Lateral concomitant variation of children with successively varying stimulus

c.v., concomitant variation; *none*, absence of concomitant variation

CHILD	SMALL FROG	WHITE RAT	LARGE FROG	RABBIT	PAROQUET	T C.V.	T NONE
A	none	none		none	none		4
B	none	none	none	none	none	1	5
C	none	none	none	c.v.	none		4
D	none	none	none	none	none		5
G		none	none	none	none		4
H	none	none	none	none	none		5
J		none	none	none	none		4
K	none	none	none	none	none		5
L	none			none	none		3
M	none	none	none	none	none		5
N	none	none	none	none	none		5
O	none	none	none	none	none		5
P	none	none	none	none	none		5
Q	none	none	none	none	none		5
R	none	none	none	none	none		5
S	none	none	none	none	none		5
T	none	none	none	none	none		5
U	none	none	none	none	none		5
V	none	none	none	c.v.	none	1	4
Total:							
c.v.....	0	0	0	2	0	2	
none....	17	18	17	17	19		88

c.v., 2.2 per cent; none, 97.7 per cent.

TABLE 3

Pressure variations to large frog

REACTORS	STIMULUS APPROACHING							STIMULUS RECEDING					
	Distance in inches												
	24	21	18	15	12	9	6	9	12	15	18	21	24
Ventral													
A	69	63	63										
B	68	65	65	62	62	60	57	62	61	66	65	63	65
C	69	69	70	70	70	64	69	70	70	70	69	71	74
D	74	73	68	68	68	67							
G	65	65	62	62	62	62			66	12	62	65	65
H	62	66	59	68	62	59	61	60	60	65	61	61	67
J	630	590	642	600	570	590			657	599	590	735	632
K	7	7	7	7	7	7	7	7	7	7	7	7	7
L													
M	74	71	72	75	71	73	75	72	75	75	75	74	72
N	70	71	70	68	72	80			73	70	65	65	65
O	71	86	79	79	75	84	92	72	82	81	79	89	
P	65	65	72	68	69					69	65	66	77
Q	9	82		67	63	63	59	59	60	60	63	66	57
R	64	62	62	62							66	66	63
S	67	67	68	68	67	67			67	67	67	67	67
T	67	66	67	68	68					61	68	65	65
U	55	60	59	82	63	55	54	58	68	60	50	50	52
V	57	54	56	54	51	50			53	52	54	53	54
Total	1576	1682	1641	1628	1500	1381	474	460	1399	1414	1506	1663	1547
Arithmetic mean	84.2	93.4	96.5	95.8	93.8	98.6	59.3	51.5	107.6	94.3	94.1	103.9	103.1
Dorsal													
A	50	54	60										
B	50	51	52	57	57	58	58	54	54	57	57	57	53
C	45	44	45	47	47	49	60	55	51	48	46	44	29
D	46	46	65	68	64	62							
G	56	63	65	65	65	65			55	60	65	53	54
H	54	62	61	61	63	63	63	63	63	62	62	63	63
J	437	550	560	600	580	587			567	522	522	475	465
K	8	42	5	52	51	52	55	55	53	55	56	57	58
L													
M	37	34	33	31	31	31	28	28	32	32	34	36	36
N	45	37	43	50	37	36			60	57	60	60	60
O	43	35	37	43	41	42	34	49	31	39	47	32	
P	47	50	40	40	33					39	40	34	27
Q	34	32		38	43	48	58	51	53	59	44	32	48
R	37	49	52	55							54	45	42
S	53	45	40	51	59	53			53	45	53	54	57
T	47	54	56	57	59					50	45	55	56
U	39	43	46	13	23	33	23	43	13	13	36	48	53
V	51	54	54	52	56	56			56	55	56	56	53
Total	1179	1345	1314	1380	1312	1234	379	398	1141	1193	1277	1201	1154
Arithmetic mean	65.6	74.7	77.3	81.1	82.0	88.1	47.4	49.8	87.8	79.5	79.8	75.1	76.9

due to the fact that several of the children had a caged rat in the institute playground the year before. B, K, and C were among the group and reacted positively; but R who had the same experience still reacted negatively.

The rabbit elicited the largest number of positive reactions or 47 per cent of the total. It also occasioned the least number of doubtful reactions or 5 per cent. Reactions to this stimulus which was the largest stimulus were the most clear cut but practically equally divided as to positiveness and negativeness.

The paroquet occasioned more negative reactions than positive responses. It also elicited a high percentage of doubtful responses. The paroquet was rather nervous on his perch and used his hooked beak continuously in eating grain or at biting the chain.

An analysis of the total approach, retreat, pursuit, and withdrawal reactions shows that 36 per cent of 182 responses were positive, 43 per cent were negative and 20 per cent were doubtful. Approach was the reaction of least frequency. This might be expected since it would require a rapid decrease of distance between the already approaching objects.

But the withdrawal from the reced-

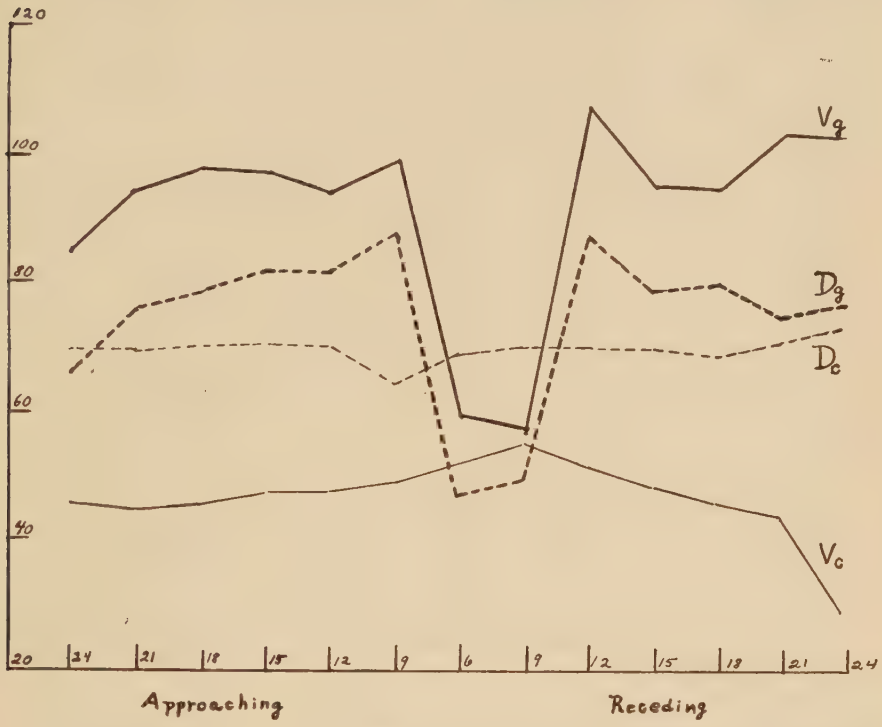

FIG. 6. VENTRAL AND DORSAL PRESSURE VARIATIONS AT DIFFERENT DISTANCES
V_g and D_g are group curves based on averages of group scores for each interval. V_c and D_c are curves for individual *C*.

ing stimulus was only of secondary frequency, *i.e.*, 16 per cent of the cases. This was to be expected since the children probably inferred the crisis was lack of emotional shift from the previous retreat.

The retreat pattern from the approaching stimulus totals 49 or 27

TABLE 4

Reaction of child to approaching or receding stimulus

Ap.—Approach; *Rt.*—Retreat; *Ps.*—Pursuit; *Wd.*—Withdrawal; *Wds.*—Withdrawal summation

— no test given. ... Doubtful responses

	SMALL FROG		WHITE RAT		LARGE FROG		RABBIT		PAROQUET	
	Coming	Going	Coming	Going	Coming	Going	Coming	Going	Coming	Going
A	Rt.	...	Rt.	Ps.	Rt.	...	Ap.	Ps.	Rt.	Wds.
B	...	Wds.	Ap.	Ps.	Rt.	Wds.	Ap.	Ps.	Rt.	Wds.
C	...	...	...	Wd.	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.
D	...	...	Rt.	Ps.	Rt.	...	Rt.	Ps.	Rt.	...
G	—	—	Rt.	Wds.	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.
H	Rt.	Ps.	...	...	...	Wd.	Ap.	Ps.	...	...
J	—	—	...	...	Rt.	Ps.	Rt.	Wds.	Rt.	Wds.
K	Rt.	Wds.	Ap.	Wds.	Rt.	Wds.	Rt.	Wds.	Ap.	Wds.
L	Rt.	...	—	—	—	—	...	...	...	...
M	Rt.	...	...	...	Ap.	Ps.	Ap.	Ps.	Ap.	Ps.
N	...	...	Rt.	Ps.	...	...	Rt.	Wds.	Ap.	Wd.
O	Ap.	Ps.	Ap.	Ps.	Ap.	Wd.	Rt.	Ps.	Ap.	Wd.
P	Ap.	Wd.	Ap.	Wd.	Ap.	Ps.	Rt.	Ps.	...	Ps.
Q	Rt.	Wds.	Ap.	Ps.	Rt.	Ps.	Ap.	Ps.	Ap.	Ps.
R	...	...	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.	Rt.	Ps.
S	Rt.	Wds.	Rt.	Wds.	Rt.	Ps.	Rt.	Ps.	Rt.	Ps.
T	...	...	Rt.	Wds.	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.
U	...	...	Ap.	Ps.	Ap.	Ps.	Rt.	Wds.	Ap.	Ps.
V	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.	Ap.	Wd.	Ap.	Ps.
Totals of types of reactions:										
Approach	2	0	6	0	4	0	6	0	6	0
Retreat	8	0	8	0	12	0	12	0	9	0
Pursuit	0	3	0	9	0	10	0	12	0	8
Withdrawal	0	1	0	2	0	2	0	1	0	1
Withdrawal summation	0	4	0	4	0	3	0	5	0	7
Doubtful	7	9	4	3	2	3	1	1	3	3

over. This reaction in most cases is due to summation of a negative reaction or fatigue which keeps the child resting in a relaxed condition on the dorsal cushion. It may also show a per cent of all cases. It occurred twice as often as approach in every case except with the paroquet.

The remarkable fact is that "pursuit" had such a great frequency while

its positive counterpart in this test, "approach" had the smallest. For this group when a stimulus is going away, pursuit is the mode of reacting to it, although retreat may have been the previous reaction-pattern.

TABLE 5

Individual reactions

	COMING ANIMAL		GOING ANIMAL		
	Approach	Retreat	Pursuit	Withdrawal	DOUBTFUL
Older children					
A	1	4	2	1	2
B	1	2	2	2	2
C		3	2	2	3
D		3	2		5
E		4	2	2	
H	2	1	2	2	3
J	1	2	2	1	2
K	1	3	1	4	1
L		1		1	5
M	3	1	2	1	3
N		2	2	1	5
Total.....	10	26	19	10	31
Younger					
O	4	1	4	1	
P	3	2	3	2	
Q		4	3	4	1
R		4	2	2	2
S		5	2	3	
T		4	2	2	2
U	3	1	3	1	2
V	2	3	3	1	2
Total.....	14	23	23	14	6
Grand total..	24	49	42	30	37

Table 5 shows that the younger group excelled the older in definitive reaction patterns. The younger children tend to make clear cut reactions.

Besides the concomitant variation of body position in regard to stimulus movements which shows the stimulus movement is a real causal factor in emotional behavior we have the corroborative testimony of the verbal report of the children. No formal questions were asked and speech was not encouraged, yet 120 verbal reports expressing the idea of distance were recorded. Some children made no verbal expressions, others made several in one test. However such that were made indicated consciousness of space factors. Usually when the object was far away the word was "Move it over to me," "Move it out," Then "have more," "a tiny bit more," "Push it some more." As the object moved closer the expressions were "That's enough" or "Enough," "Please don't," "I don't want it near." "Push it back," "Pull it away," all of which shows an explicit awareness of the space factor in the emotional situation. Some children protested "That's enough" at the 21 inch distance, others did not do so until the stimulus approached to within a few inches.

Head and hand movements. In cases where positive body movements were recorded the head was usually moved forward and the hands rested in front of the body on the tray of the chair or on the floor of the stage or were in contact with the stimulus object usually with intermittent withdrawals.

But where dorsal compression and negative report occurred the head was drawn back and the hands were fisted and held on the chest, or flat back on the shoulders or even back and hanging down behind the arm rests. In about an equal number of cases, the

fingers of one or both hands were put in the mouth, while a few pulled on their ears and hair. This last behavior was especially true of R and S.

Summary of results. Analysis of the data show that concomitant variations in ventral and dorsal pressure or consistency in responses toward approaching or receding stimuli are found in 79 per cent of the cases. Lateral concomitance is found in only 2.2 per cent of the cases. The movements to either side appear to be of little importance in response to stimuli moving forward and backward before a child restricted in a chair.

Concomitant variation or consistency in response does not show the types of response. In some cases there was withdrawal from both approaching and receding stimuli; in others withdrawal from the approaching and pursuit of the receding animal. The distance of the animal from the child was also a factor as some children consistently approached an animal coming toward them up to a certain point and then withdrew; in other cases the child failed to begin pursuit of a receding animal until he was at a distance from him. The most frequent reactions were withdrawal from the approaching animal and pursuit of the receding animal.

Reactions varied to different animals. Familiarity with the animal appears to be influential and also size of the animal. The white rat and the rabbit with which some children were familiar elicited a greater number of approach responses to the coming animal than did the other stimuli. These larger animals also elicited a greater number of retreats.

As the series progressed avertive behavior was less violent and approach reactions were freer. This would indicate reduction of emotion with successive presentations. Verbal reports tend to corroborate the findings from pressure variations.

It is already shown that not only movement of stimuli but the direction of movement relative to the position of the child is a factor of importance in the emotional behavior of the child. The number and types of movements of the child in relation to the movements of the stimulus object appear to indicate the degree of emotion aroused in the child.

MATERIALS AND STIMULI FOR STANDING TEST

In this test the major objective was the freedom of the child in approach toward or retreat from animals. An oil cloth rug 8 feet square having 4 concentric circles 1 foot apart or varying in diameter by 2 feet was placed upon the floor. A small table about 18 inches square and 18 inches high was placed in the center of the inmost circle and the stimulus object fixed upon the table as illustrated in figure 7. The stimulus objects were 3 young chicks less than three weeks old, 3 large frogs weighing two thirds of a pound each, 1 rabbit weighing about 4 pounds. These objects were placed upon the table, one kind of animal at a time, covered by a cloth of one of three bright colors. The chicks and frogs were contained in a glass dish three inches high and surrounded with a wire cage 8 inches high but open at the top. Quarter inch mesh afforded clear visibility of the object which was

illuminated from above when the cloth was removed. In the case of the rabbit a wire cage was inverted over him and the cloth draped upon the cage. On exposure of the rabbit the cloth and cage were lifted off.

Procedure in standing test

The children were brought into the room singly, where one draped object was already on the table. The experimenter stood by the child at the circumference of the outermost circle, and facing the table, gave the following direction: "This is a game. It is your part of the game to stand on this line at the start, but you can walk about as soon as I say 'Go.' I am going to show you something, which is on the table under the cloth, but you are to stand still, until I pull the cloth off the thing that is on the table. Then you can walk about and do anything you please to it." Moving to the table, stop-watch in one hand, he asks, "Now are you ready?" When the subject says "yes," the cloth is drawn off the object and placed upon a table about five feet from the stimulus object.

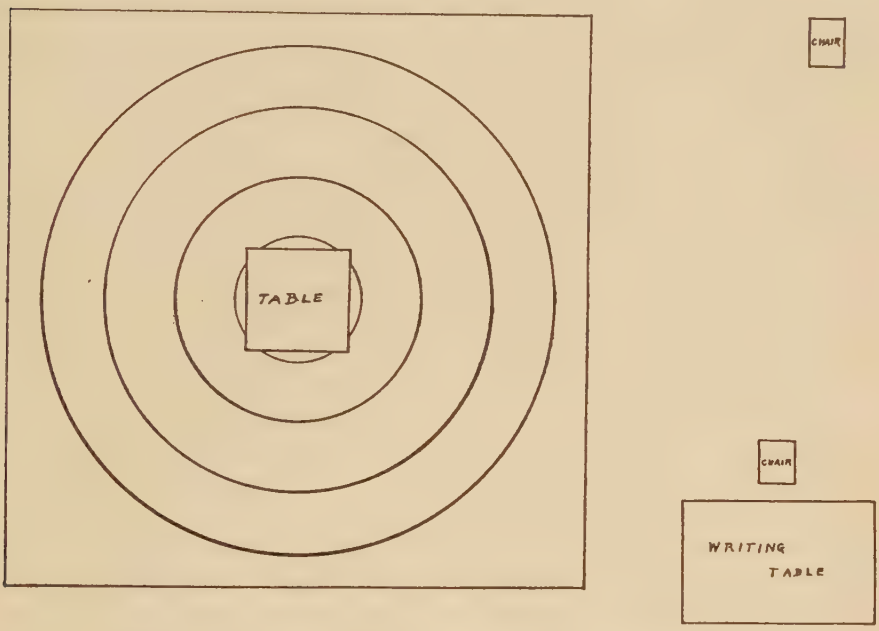

FIG. 7. ILLUSTRATION OF SITUATION IN STANDING TEST

Records were made of time when the child moved off the spot, whether he moved forward or backward, of time and distance of later movements, and of what he did with the objects. In case the child asked questions such as "Can I touch him?" he was answered "Yes." In case the child did not act spontaneously he was engaged in a conversation as to "What

is it?" "What would you like to do with it?" "Would you like to have it, or take it home?"

The time limit, in the case of children of slow or blocked reactions, was any length of time as long as the child coöperated or was interested. In case of a flat refusal it was five minutes. In case of a child picking up or carrying the stimulus object about, the test was terminated there.

Two presentations of each stimulus were made in the following order: chicks and frogs the first day, frogs and rabbit the second day, and rabbit and chicks the last day. The objects were presented in their proper cage in the order listed. The second object was brought to the table from behind a screen after the first object had been removed from sight. During this interval the child sat on a chair which was convenient during the whole test and the child could sit down at any time.

A preliminary or introductory test was given to the children in groups of five with the same apparatus. The stimulus object consisted of two stuffed ducklings. The children stood about in a circle. These group reactions were a bit quicker than in the subsequent solitary tests but still guarded, prefaced by "What are they?" Usually three or four approached the object without urging. In this introduction those who did not move spontaneously were urged to do so, to "touch it in turn." The children were also permitted to play games on the oil-cloth in order to reduce the novelty of the circles. Only two children remarked on the circular lines.

Results of the standing test. The findings of this test are considered from three aspects: the most positive-reactions, the first negative reaction, the verbal report with either positive or negative reactions.

Positive reactions. The most positive reaction was considered to consist of a time factor, the time at which the reaction occurred, and spatial and activity factors of where and what was done. These factors were put into five groups on a frequency basis as given in table 6. The reaction was the nearest position or activity at its earliest appearance after exposure of the stimulus.

The most frequent reaction to the chicks was "touching them" or "picking them up," without much improvement in the second trial over the first. Picking up was more frequent on second trial. With the frogs the tendency was to stand alongside, to lean on the table or touch the cage and to touch the frogs. No one tried to pet them, only one tried to pick them up. To the rabbit the reaction was primarily touching and petting or stroking. Three attempts were made to lift him up. Petting increased with the second exposure.

The data given in table 7 show the form of reaction and the time at which the most positive reaction was made. For the chicks the second trial showed a wider range in time before positive reaction and a higher mean time. For the other animals second trials showed a decrease in range and mean. Analysis of the forms of reaction shows that 85 per cent of the responses are contacts with the animals or reaching toward them. These responses are much less frequent to frogs than

to the chicks or rabbits. Certain animals appear to provoke more caution in approach than others. The two cases of picking up the frog were responses of the same child and the same group of children were responsible for the touching response for the small and the big frog. Familiarity with the animal is a prominent factor in the response.

Negative reactions. Negative reactions were reactions made when the subject moved body away from the stimulus. The hand movements away from the objects after single or successive touches or strokes are not included although they occurred frequently, too frequently to be recorded with accuracy.

The negative reactions must be divided on the basis of the stimulus as being quiet and as being active or

TABLE 6

Most positive reactions and time of occurrence

Sa = alongside, Re = reach for, lean over, shake table, Th = touch, Pk. = petting or picking up. S with a numeral indicates standing at that distance from center as S3 standing 3 feet from the center. In the case of 5 it may mean sitting down or leaning against the wall.

REACTOR	CHICKS				FROGS				RABBITS			
	First trial		Second trial		First trial		Second trial		First trial		Second trial	
	Reaction	Second	Reaction	Second	Reaction	Second	Reaction	Second	Reaction	Second	Reaction	Second
W−	S2	165	Pk	25	Th	360	Re	60	S2	105	Pk	180
S	Pk	150	S3	27	Sa	240	S6	180	Sa	315	S5	310
R	S2½	240	Sa	10	S2	180	Sa	90	S5	420	S6	360
U	Th	12	Th	10	Th	12	Th	10	S2½	135	Th	15
F	Th	255	Th	120	Th	165	Re	255	Th	7	Pk	10
B	Th	25	Pk	90	Th	340	Th	60	Pk	90	Pk	50
C	Th	15	Pk	180	S1	70	Sa	10	Pk	150	Th	20
N	Th	12	Pk	60	Th	15	Th	120	Th	15	Pk	15
O	Pk	55	Pk	65	Th	140	Th	15	Pk	140	Th	25
T	Pk	35	Pk	5	Pk	15	Pk	60	Pk	40	Pk	10
V	Pk	40	Pk	10	Re	15	Sa	25	Th	180	Pk	10
A	Pk	20	Pk	35	Th	45	Th	20	Th	375	Pk	135
M	Th	35	Th	150	Sa	63	Sa	5	Pk	45	Pk	30
E	S2½	150	Th	30	S2	10	S2	105	S3	285	S3	120
H	Th	45	Pk	25	S1	10	Th	20	Pk	120	Pk	40
L	Pk	25	Pk	10	Sa	5	Sa	150	Pk	95	Th	12
K	Pk	120	Pk	20	Sa	7	S2	20	Pk	15	Pk	5
Q	Pk	35	Th	30	Sa	5	Sa	10	Th	360	Pk	100
P	S1	7	Th	25	Sa	5	Sa	5	Pk	180	Sa	120
D	Pk	15	Pk	20	Th	15	Th	90	Pk	50	Pk	15
Range of time.....	7–255		10–275		5–360		5–255		7–420		5–360	
Mean time...	72.8		47.3		85.8		65.5		156.1		79.1	

moving, hopping or flying. On this basis of comparison the negative reactions may be divided as follows:

STIMULUS	NUMBER OF RETREATING REACTIONS			
Rabbit	quiet 15	moving	4
Frogs	quiet 19	jumping	15
Chicks	quiet 10	flying	3

It must be noted that the rabbit moved his head about at every trial and likewise the frogs climbed or tugged at a 10-inch leash in every case. When the chicks began to fly out

TABLE 7

Frequency of reaction types

TYPES OF REACTIONS	TO CHICKS	TO FROGS	TO RABBIT	TOTAL
Picking up	21	2	22	45
Touching	13	15	9	37
Reaching	0	3	0	3
Standing alongside	1	13	2	16
At 1 foot	1	2	0	3
At 2 feet	3	4	2	9
At 3 feet	1	0	2	3
At 4 feet	0	0	0	0
At 5 feet	0	0	2	2

younger ones were substituted, but the chicks pecked and moved about in the cage incessantly. Moving includes on the part of the stimuli hopping, climbing, scratching the board by the rabbit and flying. The negative reactions occurred when the animals jumped, scratched or flew. In these cases the reaction was immediate and uniformly so as far as could be observed. Other reasons for withdrawal were to speak to experimenter, to sit in a chair, to look out the window, to get the covering cloth to cover animals, "to get a stick."

It may be said that there is a limit to tolerance of the stimulus perhaps due to fatigue or summation of negative factors. The test was cut off in those cases and when the child picked up the animals. In the latter case there was no possibility for fatigue or negative summation. Table 8 illustrates the relative frequency and distances to which the children withdrew from the stimuli. The frogs caused more negative reactions than the other two stimuli combined and also occasioned the most distant withdrawals.

TABLE 8

Frequency of negative reactions at varying distances

DISTANCE AT	RABBIT	FROGS	CHICKS	TOTAL
1 foot	0	1	0	1
2 feet	2	1	0	3
3 feet	7	7	2	16
4 feet	0	7	2	9
5 feet	5	6	5	16
6 feet	2	2	0	4
Experimenter	2	8	2	12
8 feet	0	0	1	1
Total	18	32	12	62

On the probability that animal movements occurred as frequently with the older as with the younger children it appears that the younger made more negative reactions than the older. Among the older children 8 were negative to the frog, 6 to the rabbit and 3 to the chicks, 1 to none of them. Among the younger, 10 were negative to the frog, 7 to the rabbit, 7 to the chicks.

Verbal report. Language expression was of two kinds, spontaneous and requested. The requested was in re-

sponse to the following queries: "Would you like to touch, (play with or see) it?" "Would you like to have (or be given) it?" "Would you like to take it home?" Answers of "Yes" or an affirmative headshake are considered a positive answer; "No," or a negative headshake are considered a negative answer. Spontaneous report is expression arising freely from the child without intervention or in reply to "What do you think about it?"

Spontaneous reports included cases of the following: "I'm afraid," "I like," "I wish I had," "He's good, I'd like to take home," "He's all right," "Pretty," "I don't like those," "I don't know," "Let's kiss 'em," "I wouldn't take 'em." There were 30 such spontaneous expressions.

The verbal report was considered in relation to the position of the child at the time. Obvious cases of doubtful expression occur. Similarly the problem of where to mark near and far is not easy to solve. The writer has considered near to mean alongside and within one foot away from the animal which is within easy reaching distance. The responses are summarized as follows:

	CHICKS	FROGS	RABBIT	TOTAL
Positive near	24	7	19	50
Negative near	1	8	1	10
Positive far	0	0	0	0
Negative far	8	18	8	34
Doubtful cases				6

As is evident above 50 per cent of the reactions consisted of positive expressions while near the stimulus and 34 per cent of the reactions consisted of negative expressions while relatively far from the stimulus. This gives 84 per cent of the cases in which bodily proximity concomitantly accompanies positive tendencies or attitudes and bodily distance accompanies negative tendencies or attitudes. Of special significance is the absence of any affirmative expression coincident with a distant position. Of the 10 cases which disagree with the general findings 8 of these pertain to frog stimuli which are complicated by wetness and odor.

A summary of the results for the condition of freedom of movement by the child toward or away from animals that are restricted in space shows that 85 per cent of the responses are approach, including reaching toward, touching, and picking up the animal. These responses vary in frequency for different animals. These variations appear to be due in part to the size of the animal and to the amount of activity of the animal. Verbal reports also show that the approach reactions are accompanied by expressions of desire for possession and withdrawal reactions are accompanied by expressions that indicate a desire to avoid nearness or contact with the animal.

Though the negative reactions are much less frequent under conditions of freedom of movement there are individual differences among children in the degree of emotion manifested. The spatial factor of distance from the stimulus correlates closely with the type of reaction made though in a few cases the movements of the animal cause withdrawal reactions after contact has been made.

GENERAL CONCLUSIONS

In a study of spatial factors as influential upon emotional responses two situations were presented. In one the child was restricted and five animals, used as stimuli were moved toward or away from the child. In the other situation, the child was free to move and the animal was restricted in space. Seeking or approach responses occurred much more frequently when freedom of movement was permitted the child.

Analysis of results for consistency in types of movements under conditions of the first situation shows a high percentage of concomitant variation in forward and backward movements to approaching or receding stimuli. The most frequent relation found was withdrawal from a coming animal and pursuit of the animal going away.

The shifting in reactions of children to the changing movements of the animal shows that not only movements but direction of movements in relation to the position of the child are influential upon these reactions. An approach toward the animal seemingly a manifestation of curiosity often changes to withdrawal as the animal comes close to the child. As the animal moves away sustained withdrawal often changes to an approach.

In both situations different animals elicited different reactions. Size and activity of the animal, familiarity, and distance from the child were influencing factors. In a state of freedom of the child to move as he desired contacts with the animal, near contacts such as reaching toward it, and approaches to nearer positions were more frequent for all animals than under restriction of movement of the child.

With restriction of movement of the child the forward and backward movements as measured by the ventral and dorsal pressure variations show greater responsiveness of an emotional type than less controlled observations would indicate. Restriction of the child in space often occasions emotion. With the addition of an approaching animal we have behavior that indicates varying degrees of emotion. Verbal expressions reënforce the conclusion that concomitant variations in the responses to moving stimuli offer a valuable method of study of emotion in children.

The modification of responses with successive presentations may show adjustment to the experimental conditions. The decrease in avoidance reactions and in speed or violence of such reactions as indicated by the pressure variations leads to the conclusion that there is a reduction in the emotion aroused. The avoidance reactions that are usually assumed to indicate fear are modified and the seeking reactions are more frequent, and more pronounced. This would indicate a modification from one form of emotional behavior into another.

There are marked individual differences among children in the responses made in both experimental situations. Some do not progress beyond a retreat response though the extent or degree of avoidance is decreased. Others progress rapidly from withdrawal to approaching reactions and attempts at possession. The pressure variation

method showed lack of concomitance with excessive movement indicating a state of incoördination for some individuals. In other cases the response was primarily a rigid posture, and the records give no indication of the reaction tendency. Verbal reports and similar responses in the other test with freedom of movement indicate that these posture reactions show negative or withdrawal tendencies.

A practical implication of this study is that the adjustment of a child to situations that provoke undue emotion is best made under conditions in which he has freedom in response except for the continued presence of the stimulus that arouses emotion. With successive presentations it may be expected that the emotion will be reduced and the behavior will be modified into more desirable forms.

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Vita

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